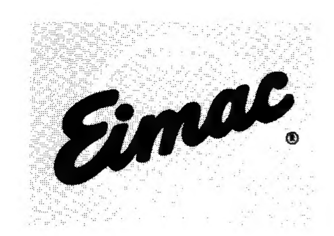
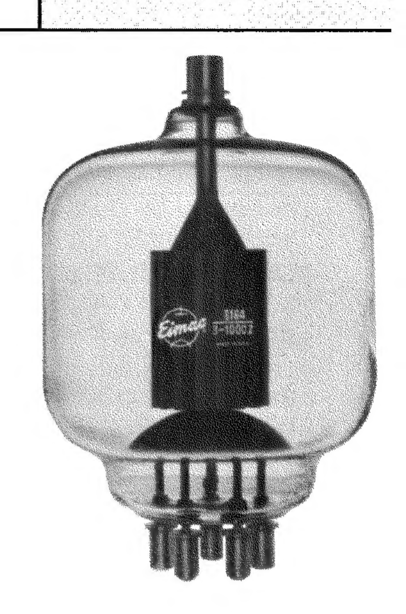


EIMAC
Division of Varian
SAN CARLOS
CALIFORNIA

8164 / 3-1000Z

HIGH-MU POWER TRIODE



The EIMAC 8164/3-1000Z is a compact power triode intended to be used as a zero-bias Class-B amplifier in audio or radio-frequency applications. Operation with zero grid bias simplifies associated circuitry by eliminating the bias supply. In addition, grounded-grid operation is attractive since a power gain as high as twenty times can be obtained with the 8164/3-1000Z in a cathode driven circuit.

GENERAL CHARACTERISTICS

ELECTRICAL

	Min.	*Nom.*	*Max.*	
Filament: Thoriated Tungsten				
Voltage		7.5		volts
Current	21.5		22.7	amps
Amplification Factor (Average)		200		
Interelectrode Capacitance (Grounded Cathode)				
Input	15.0		19.0	pf
Output			0.3	pf
Grid-Plate	6.0		9.0	pf
Interelectrode Capacitance (Grounded-Grid)				
Input	15.0		19.0	pf
Output	6.0		9.0	pf
Plate-Cathode			0.3	pf
Frequency for Maximum Ratings			110	MHz

MECHANICAL

Base	5 Pin Special
Mounting Position	Vertical, base down or up
Cooling	Radiation and forced air
Recommended Heat-Dissipating Plate Connector	EIMAC HR-8
Recommended Socket	EIMAC SK-510
Recommended Chimney	EIMAC SK-516
Maximum Operating Temperatures:	
Plate Seal	225°C
Base Seals	200°C
Maximum Over-all Dimensions:	
Height	7.88 inches
Diameter	5.25 inches
Net Weight	1.2 pounds

RADIO FREQUENCY POWER AMPLIFIER

Class C, Grid Driven

MAXIMUM RATINGS

DC PLATE VOLTAGE	6000 VOLTS
DC PLATE CURRENT	700 MA
GRID DISSIPATION	50 WATTS
PLATE DISSIPATION	1000 WATTS

TYPICAL OPERATION

DC Plate Voltage	3000	4500	6000 volts
DC Grid Voltage	—30*	—75	—100 volts
DC Plate Current	700	700	700 mA
DC Grid Current	230	240	250 mA
Peak RF Grid Voltage	107	200	230 volts
Grid Driving Power	27	48	57 watts
Power Output	1300	2250	3200 watts

*Operating bias may be wholly derived from grid current flowing through 130 ohm, 25 watt resistor.

PLATE MODULATED RF AMPLIFIER

Class C

MAXIMUM RATINGS

DC PLATE VOLTAGE	4500 VOLTS
DC PLATE CURRENT	550 MA
GRID DISSIPATION	50 WATTS
PLATE DISSIPATION	670 WATTS

*Drive modulation is required with a high-mu triode

TYPICAL OPERATION*

DC Plate Voltage	4500 volts
DC Grid Voltage	—100 volts
DC Plate Current	500 mA
DC Grid Current	170 mA
Drive Power	35 watts
Output Power (carrier)	1765 watts

RADIO-FREQUENCY LINEAR AMPLIFIER

Clas B, Zero Bias, Cathode Driven

MAXIMUM RATINGS

DC PLATE VOLTAGE	6000 VOLTS
DC PLATE CURRENT	800 MA
GRID DISSIPATION	50 WATTS
PLATE DISSIPATION	1000 WATTS

*Measured values in operating equipment.

TYPICAL OPERATION

DC Plate Voltage	2500	3000 volts
Zero-Signal DC Plate Current	162	240 mA
Max. Signal DC Plate Current	800	670 mA
Max. Signal DC Grid Current	260	220 volts
Max. Signal Drive Power	100	90 watts
Plate Load Impedance	1760	2650 ohms
Nominal Cathode Impedance	65	67 ohms
Plate Output Power	1050	1080 watts
Intermodulation Distortion Products:* 3rd Order	—32	—29 db
5th Order	—39	—37 db

AUDIO FREQUENCY AMPLIFIER OR MODULATOR

Class B

MAXIMUM RATINGS (per tube)

DC PLATE VOLTAGE	6000 VOLTS
DC PLATE CURRENT	800 MA
PLATE DISSIPATION	1000 WATTS
GRID DISSIPATION	50 WATTS

*Approximate Value. Adjust to provide stated zero-signal plate current.

TYPICAL OPERATION
(Sinusoidal Wave, Two Tubes, Grid Driven)

DC Plate Voltage	3000	5000 volts
DC Grid Voltage	0	—13*volts
Zero-Signal DC Plate Current	350	200 mA
Max. Signal DC Plate Current	1450	1000 mA
Max. Signal DC Grid Current	485	310 mA
Driving Power	48	28 watts
Peak AF Driving Voltage	100	90 volts
Load Resistance Plate to Plate	3940	10,200 ohms
Max. Sig. Plate Output Power	2540	3560 watts

NOTE: In most cases, "TYPICAL OPERATION" data are obtained by calculation from published characteristic curves and confirmed by direct tests. No allowance for circuit losses, either input or output, has been made. Exceptions are distinguished by a listing of "Useful" output power as opposed to "Plate" output power. Values appearing in these groups have been obtained from existing equipment(s) and the output power is that measured at the load.

APPLICATION

MOUNTING—The 3-1000Z must be operated vertically, base up or base down. A flexible connecting strap should be provided between the EIMAC HR-8 Heat Dissipating Connector on the plate terminal and the external plate circuit. The tube must be protected from severe vibration and shock. The EIMAC SK-510 socket or equivalent must be employed to prevent excess lateral pressure on base pins and seal of the tube.

COOLING—Forced-air cooling is required to maintain the base seals at a temperature below 200°C, and the plate seal at a temperature below 225°C. When using the EIMAC SK-510 Air-System Socket and SK-516 Chimney, a minimum air flow rate of 25 cubic feet per minute at a static pressure of approximately 0.43 inch of water, as measured at the socket at sea level, is required to provide adequate cooling at an inlet air temperature of 50°C. Above 30 megahertz the required air flow is increased to 35 cubic feet per minute at a static pressure of approximately 0.8 inch of water, as measured at the SK-510 socket. Cooling air must be supplied to the tube even when the filament alone is on during standby periods.

When a socket other than the SK-510 is used, provisions must be made for equivalent cooling of the base, the envelope, and the plate seal. In all cases, air flow rates in excess of the minimum requirements, will prolong tube life.

FILAMENT OPERATION—The rated filament voltage for the 3-1000Z is 7.5 volts. Filament voltage, as measured at the socket, must be maintained within the range of 7.13 to 7.87 volts to obtain maximum tube life. Operation at reduced voltage decreases emission capability, but increases life expectancy.

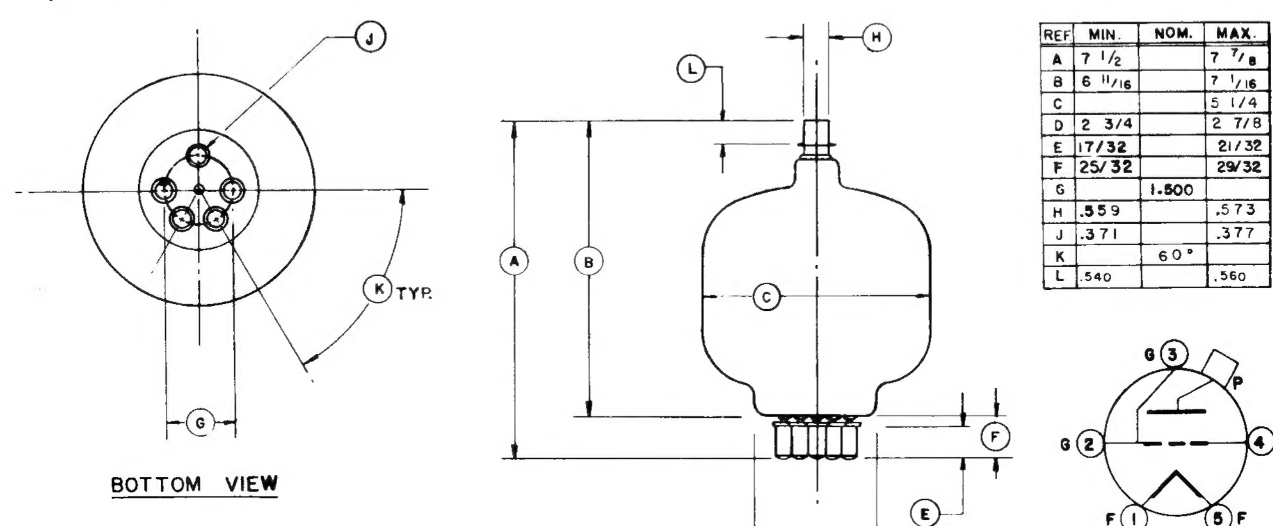
INTERMODULATION DISTORTION—Typical Operating Conditions and Intermodulation Distortion Product values are derived from measurements made at 2 MHz and are referred to one tone of a two-tone test signal. As the driving signal is reduced below full peak envelope power, distortion products remain at, or better than, the indicated value.

CLASS C OPERATION—Although designed for Class B service, the 3-1000Z may be operated as a Class-C power amplifier or oscillator, or as a plate-modulated rf amplifier. The zero-bias characteristics can be used to advantage in Class C amplifiers by employing only grid leak bias. If driving power fails, plate dissipation is kept to a low level since the tube will operate at normal, static zero-bias conditions.

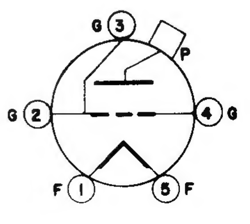
ZERO-BIAS OPERATION—Operating at zero-bias is not recommended with plate voltages over 3500 volts since plate dissipation may be exceeded. Similarly, the safety of zero-bias operation as mentioned above under "Class-C Operation" is not available at plate voltages above 3500 volts. Straight Class-C or Class-B operation is, of course, permissible up to 6000 volts where other ratings are not exceeded.

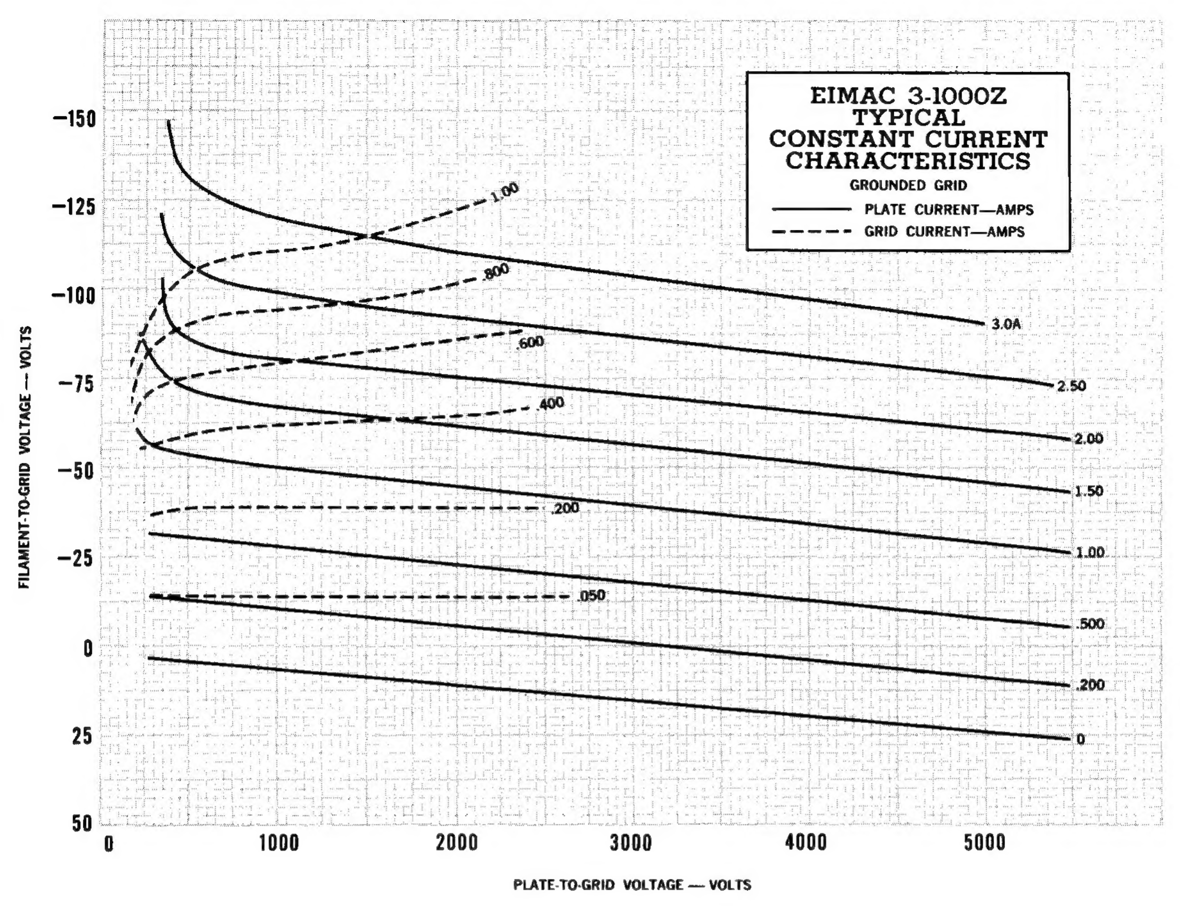
INPUT CIRCUIT — When the 3-1000Z is operated as a grounded-grid rf amplifier, the use of a resonant tank in the cathode circuit is recommended in order to obtain greatest linearity and power output. For best results with a single-ended amplifier it is suggested that the cathode tank circuit operate at a "Q" of two or more.

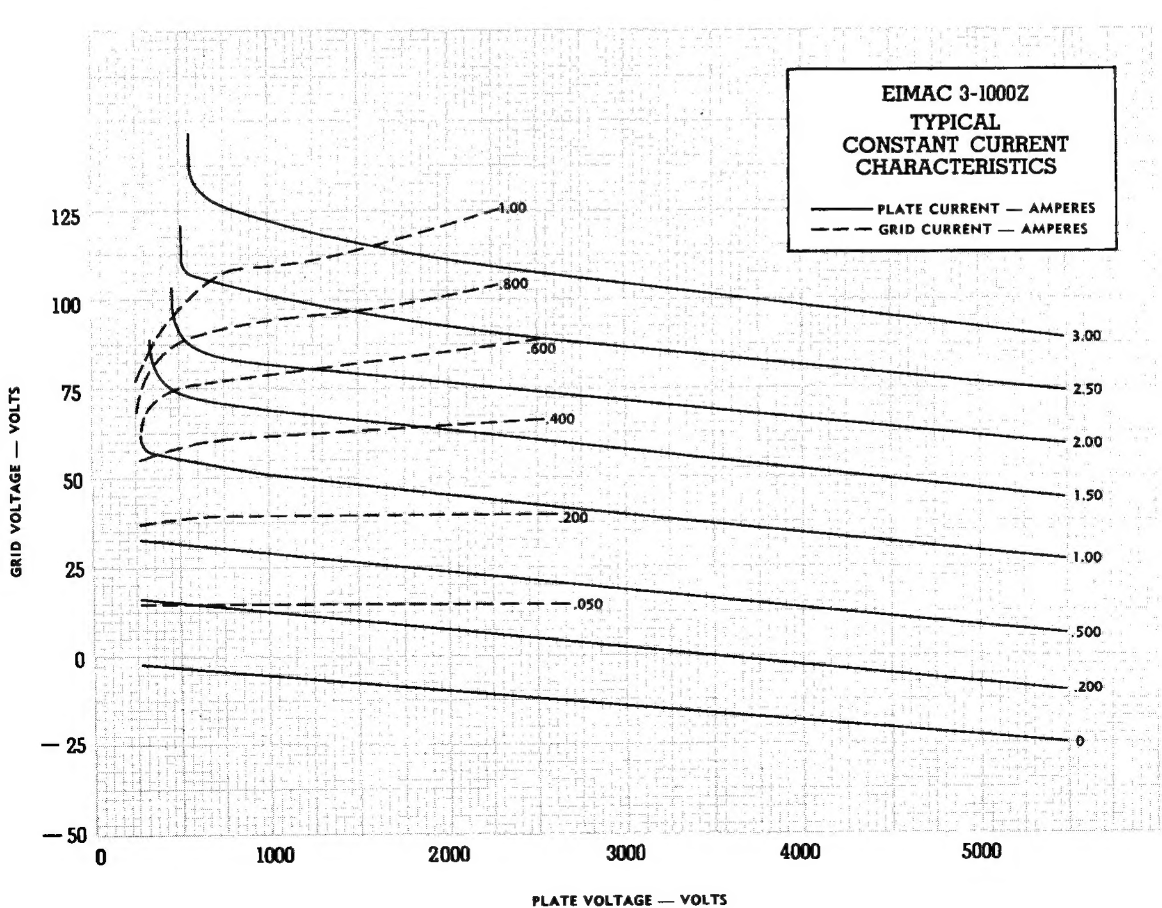
SPECIAL APPLICATIONS—If it is desired to operate this tube under conditions widely different from those given here, write to Power Grid Tube Marketing, EIMAC Division of Varian, 301 Industrial Way, San Carlos, California, for information and recommendations.



REF.	MIN.	NOM.	MAX.
A	7 1/2		7 7/8
B	6 11/16		7 1/16
C			5 1/4
D	2 3/4		2 7/8
E	17/32		21/32
F	25/32		29/32
G		1.500	
H	.559		.573
J	.371		.377
K		60°	
L	.540		.560




EIMAC 3-1000Z
TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
GROUNDED GRID
PLATE CURRENT—AMPS
GRID CURRENT—AMPS
FILAMENT-TO-GRID VOLTAGE — VOLTS
PLATE-TO-GRID VOLTAGE — VOLTS
-150
-125
-100
-75
-50
-25
0
25
50
0
1000
2000
3000
4000
5000
3.0A
2.50
2.00
1.50
1.00
.500
.200
0
1.00
.800
.600
.400
.200
.050


EIMAC 3-1000Z
TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
PLATE CURRENT — AMPERES
GRID CURRENT — AMPERES
GRID VOLTAGE — VOLTS
PLATE VOLTAGE — VOLTS
125
100
75
50
25
0
— 25
— 50
0
1000
2000
3000
4000
5000
3.00
2.50
2.00
1.50
1.00
.500
.200
0
1.00
.800
.600
.400
.200
.050